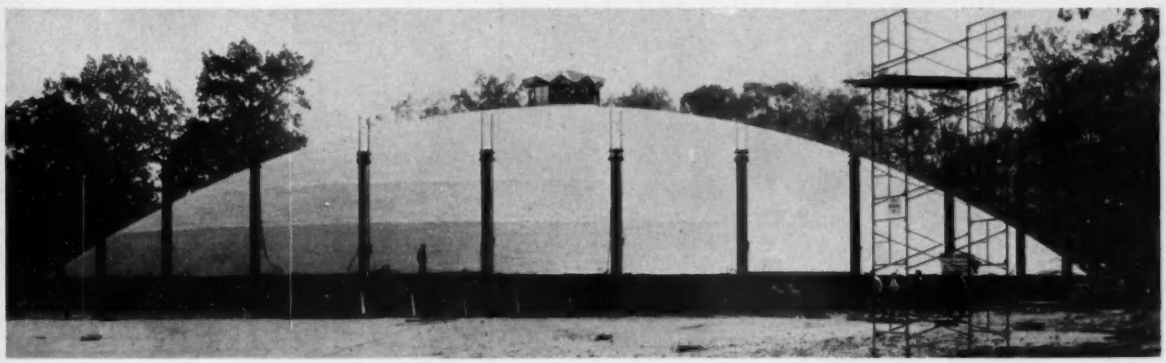
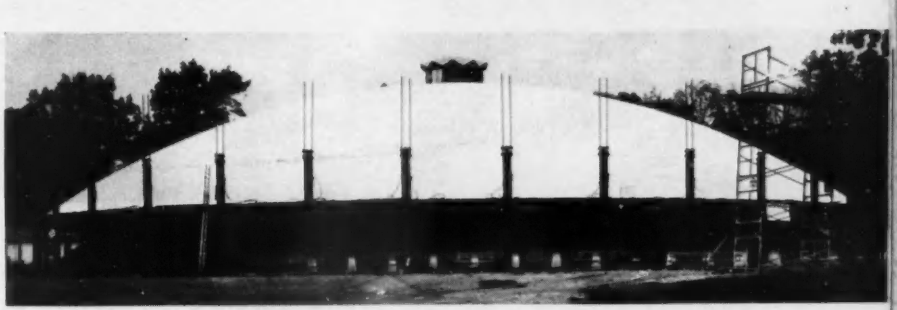
A DOMED AUDITORIUM . . .

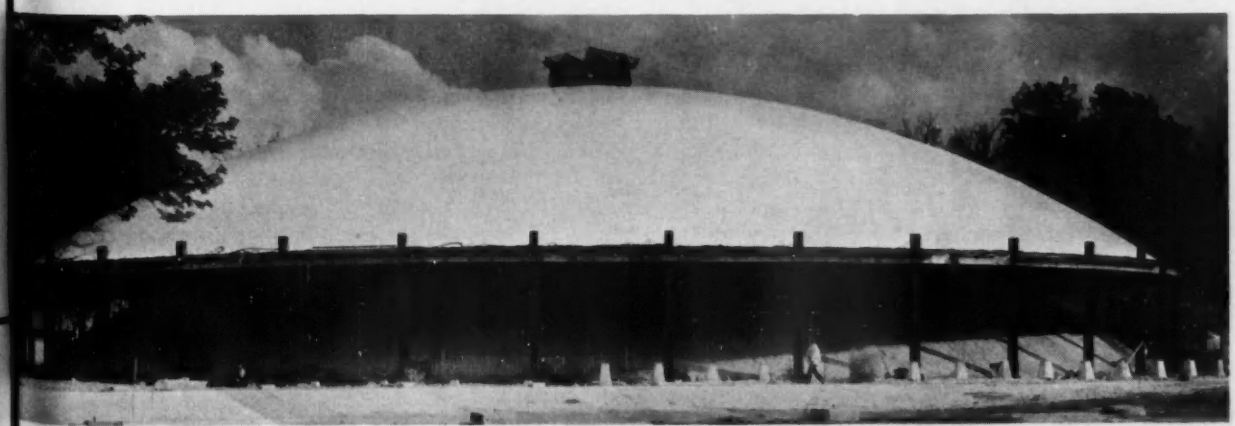
for less than the cost of a warehouse

CONCRETE HAS WON another significant round in the perpetual battle to control building costs in connection with a new auditorium which seems destined to rack up an impressive number of "firsts." The Warner Auditorium, still under construction at Anderson, Indiana, is certainly going to take its place as one of the world's largest concrete domes, and in all probability it will rank as one of the largest pure domes ever built of any material. Just to top things off, the dome was lifted into position to set some sort of record for the size and weight of structures positioned in this manner, as well as to become the first dome of any kind ever lifted. MORE



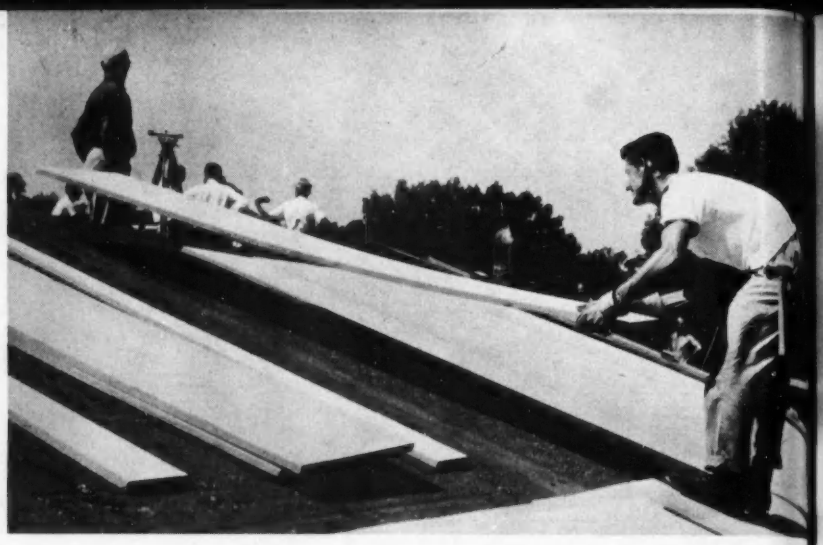


Three stages in lifting of concrete dome. The top photo, showing dome before lifting operations began, clearly outlines supporting columns equipped with hydraulic jacks on top of steel rods alongside. The rods connect the jacks to lifting collars in the dome's post-tension ring. At right, partial rise of dome plus rods as they do the job. Below, dome in place with rods removed.



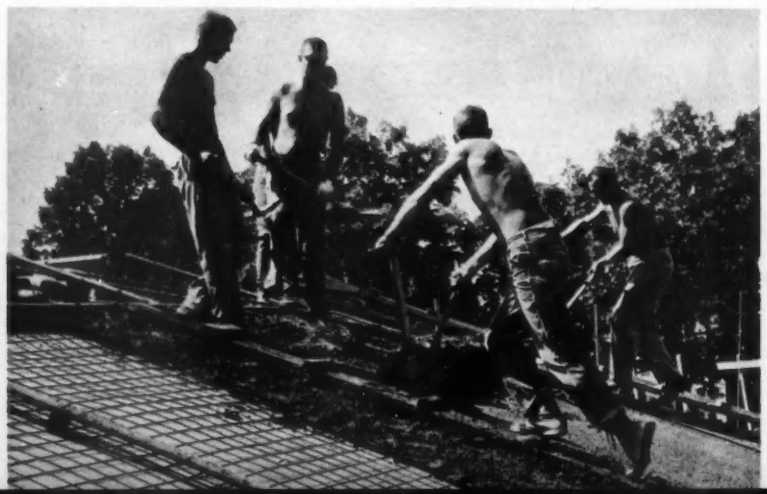
FILE: Thin Shell

RIGHT: When the earth and gravel fill for each section of the dome was properly shaped, rigid foamed polystyrene planks were laid down as a base for the concrete. This material became a permanent part of the structure, providing a much-to-be-desired insulation value to the thin shell of concrete.



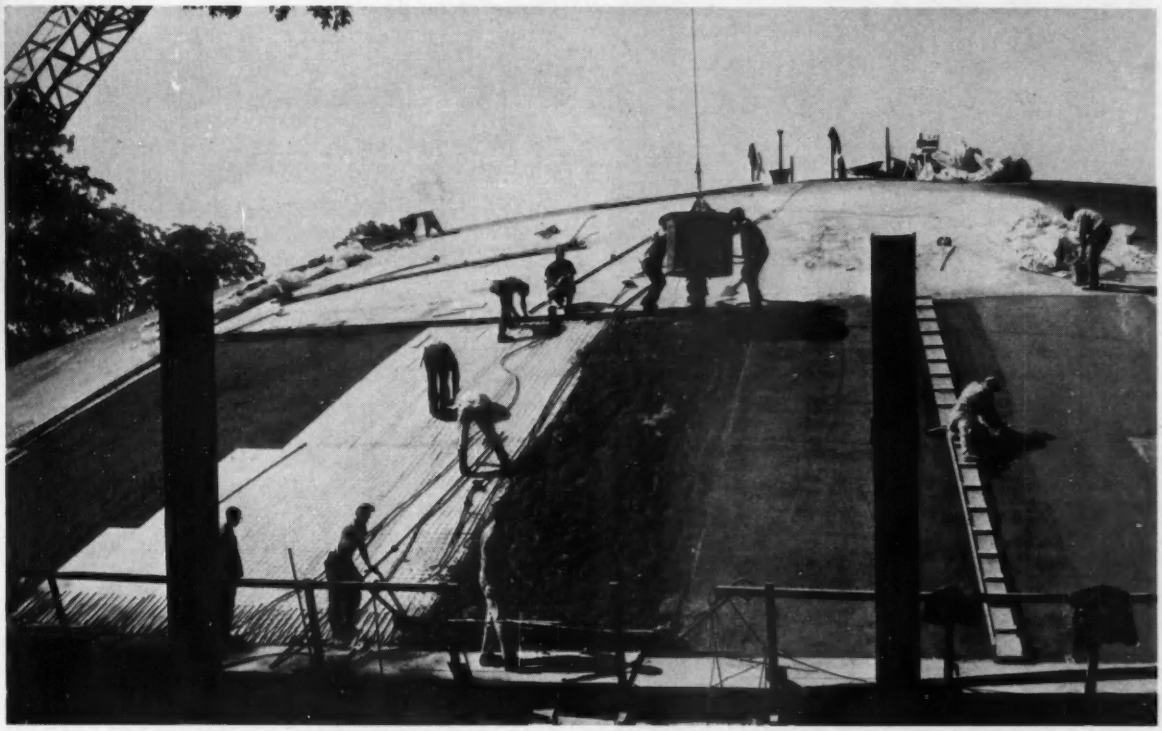
LEFT: Here a ready mix truck is discharging concrete from a ramp for the lower section of the dome. After each ring was cast in this fashion, the earth fill was shaped for a new ring above and a new ramp was created to permit the trucks to operate.

BELOW: Here architect James O. Johnson (right foreground) and contractor Chet Lewis watch workmen spreading concrete on the dome. The work of placing and finishing was handled at all times by a 6-man crew.



LEFT: A specially built 8-foot vibrating screed is shown here on one of the 4 or 5 passes used to strike off and consolidate the lightweight concrete before finishing. Note that wire mesh reinforcement is being used in this upper ring of the dome, whereas steel rods were employed in the lower sections.

Here a conventional concrete bucket is used to place concrete to fill in the ramp used by the ready mix trucks in casting the rest of the dome.



The actual statistics are equally impressive. The dome covers an area roughly the size of a football field, measuring 268 feet 4 inches from center to center of supporting columns. Its highest point above tops of columns is 40 feet 5 inches, and the highest point above the ground is 68 feet. It rests on 36 steel columns, each 26 feet high. The dome weighs 3,000,000 pounds and the concrete in it is entirely in compression.

But perhaps the most astonishing statistic for architects and builders is the incredibly low total cost being achieved with this remarkable structure. Of a total estimated cost of $396,000, structural elements such as the dome and the supporting columns account for only $178,000, with the remaining $218,000 completion costs representing walls, a concrete canopy, floor slabs and rooms. This all works out to an astonishing $6.50 per square foot, compared to an average of $12.00 per square foot for new schools, churches and similar structures in this area.

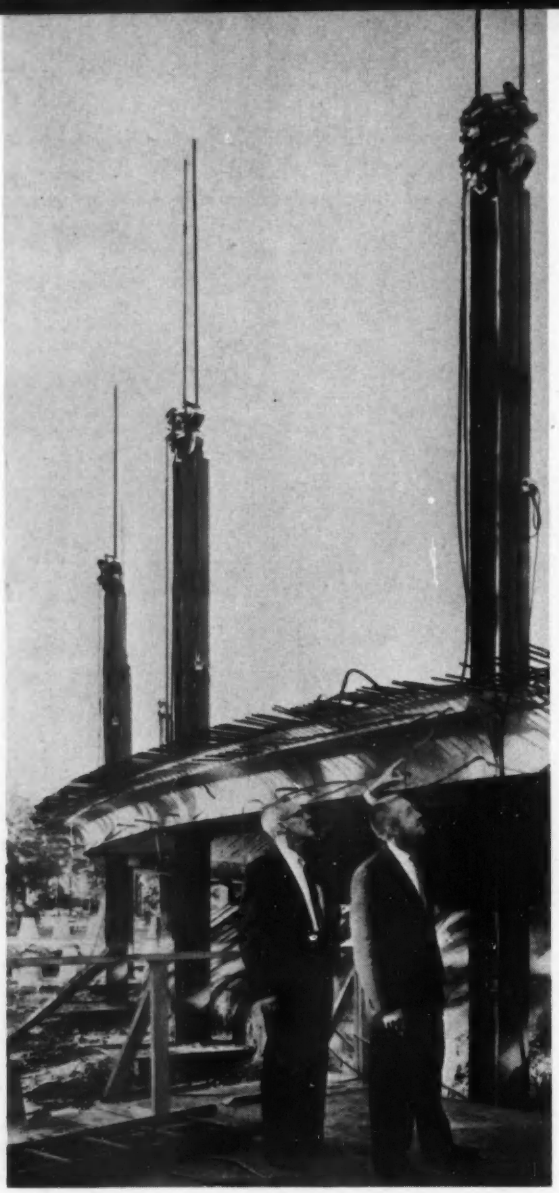
With an initial seating capacity of 7,200 the cost of the auditorium represents about $55.00 per person. Similar figures for most church buildings run many times this amount. The design provides for the eventual addition of a balcony seating 5,000 people.

The building will serve as international headquarters for the Church of God. The original plan was to build a geodesic dome, but this idea got no farther than the model stage when it was abandoned due to cost considerations. With the possibility of a concrete shell dome definitely in the picture, everyone connected with the project became intimately involved in one of the most unrelenting cost-cutting endeavors in recent construction history.

For example it was quickly determined that just the rental of scaffolding for concrete work on only 25 percent of the dome would cost $60,000. Right there was conceived the daring idea of casting the dome on the ground and lifting it into place. It was quickly determined that pit-run gravel could be brought in, graded to the desired shape and later removed at a cost of only $22,000. This innovation also made it possible to discharge concrete into place directly from ready mix trucks without intermediate handling — another important factor contributing to the low total cost.

The first stage of construction was the digging of a deep trench around the entire perimeter of the dome. To this excavated material enough dirt and gravel was added to provide a bottom mold for the entire dome. This material (equivalent in quantity to the excavation for 850 basements) was simply rented for this purpose, since the need for it was temporary.

When the fill had been accurately shaped it was



Close-up view of steel supporting columns crowned with jacks and connected via rods to the post-tension ring of dome.

View of underside of dome, showing earth forming and the rigid foamed polystyrene planks that serve as permanent insulation.

lined with slabs of rigid foamed polystyrene* measuring 2 feet wide by 8 feet long by 1 inch thick. These slabs provide excellent insulation and become a permanent part of the structure. Reinforcing bars were placed directly on these plastic slabs. This material was laid down in various predetermined levels measuring about 12 feet in width by 16 feet in length. Ramps were created above each level so that the ready mix trucks could place concrete precisely where it was desired. A special 12-foot vibrating screed, maneuvered partly by tractor and partly manually, made four or five passes before troweling was commenced.

The dome is kept permanently in compression by means of a post-tensioned compression ring measuring 36 inches wide by 24 inches deep and extending around the entire perimeter. The post-tensioning was done with 3 layers of 4 tendons each of high tensile steel wires. The wires are in metal conduit, each tendon containing 40 wires of ¼-inch steel. After stressing the conduit was filled with concrete to create bond with the wires and prevent rusting. The compressive force in the ring is 720,000 pounds.

Concrete for the dome is a Haydite lightweight aggregate mixture having a unit weight of about 100 pounds per cubic foot. Throughout most of the dome the thickness of the concrete ranges from about 4 inches to 10 inches. Placing and finishing of the concrete was handled for the most part by a crew of 6 men, making many small casts each day. To a considerable extent the remarkable cost showing must be attributed to this basic approach; the contractor and his men simply regarded the whole undertaking as another slab-on-grade job.

The dome was successfully lifted from October 17 to 21, using the Youst-Slick method with hydraulic jacks mounted on the tops of the steel columns. Threaded rods reached down to the compression ring where they were attached to steel collars cast right into the ring concrete.

The architects for the Warner Auditorium are Johnson, Ritchart and Associates of Anderson, and the general contractor is Lewis Construction Company, also of Anderson. All of the ready mixed concrete for the project was provided by Salling Concrete Corporation of Anderson. The lifting was done by Sky-Hook Lift Slab Company of Kansas City, Kansas. The structure is scheduled for completion in May, 1962. END

*See "Foamed Plastic Planks Provide Self Supporting Form For Hyperbolic Paraboloid Roofs," Concrete Construction, July 1960, page 196.

Readers who would like to have additional information on the subject of this domed auditorium may request it by circling the appropriate key letter on the reader service card in this issue.

KING-SIZED TENTS . . .

another effective tool for maintaining tough concrete placement schedules on a year-round basis

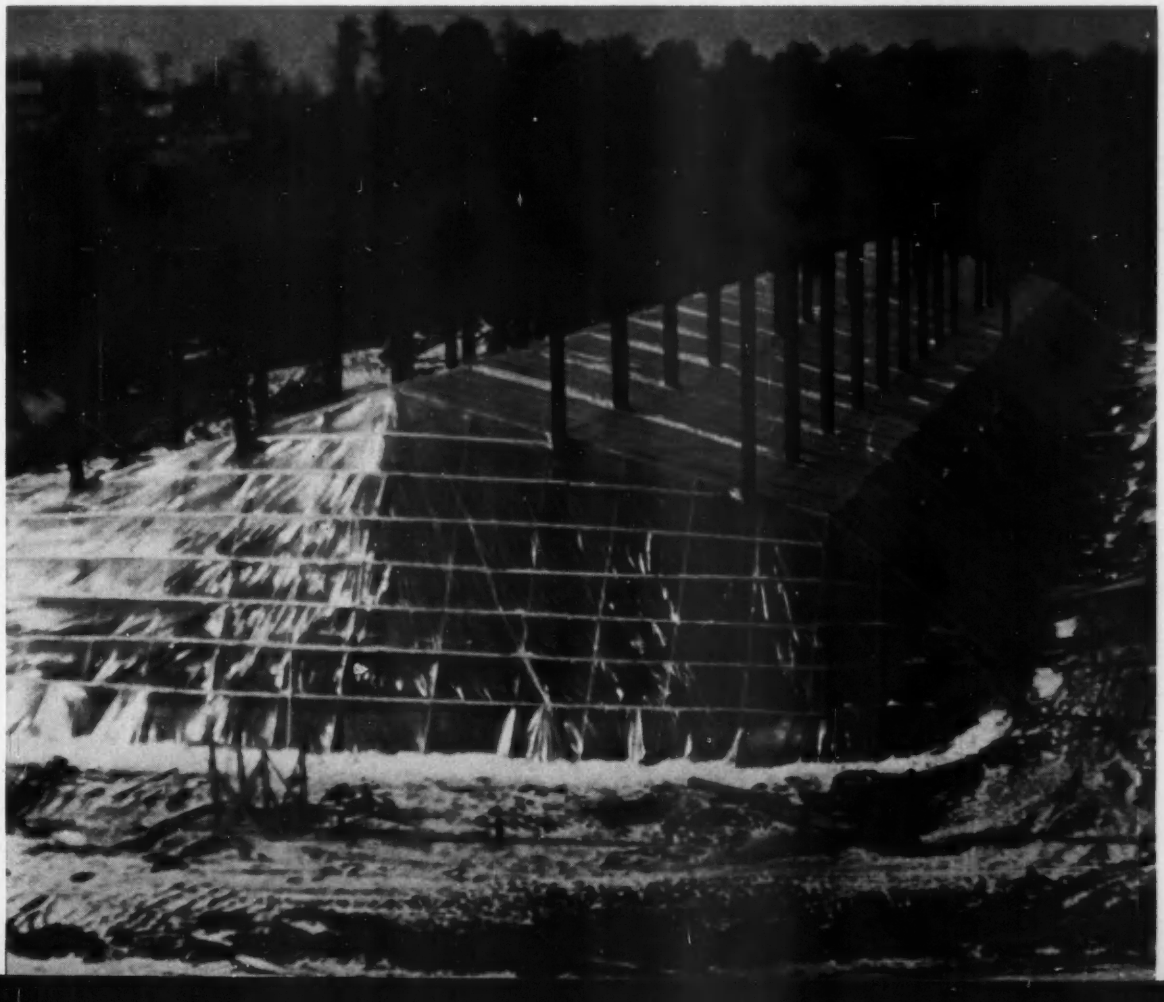
FEW PROFIT-MINDED BUILDERS today think in terms of a limited construction season. The urgent need to keep costly equipment in use, the demands of workmen for year-around employment, and the whole pace of the modern world have simply made it essential that major construction projects proceed without regard to the seasons.

Polyethylene films* rank high among the relatively new materials which have helped the field of construction in general, and of concrete construction in particular, to gain a considerable measure of independence from the weather. A case in point is the recent use of a polyethylene hood the size of a football field to cover an entire concrete construction project—a $2,000,000, 10-story Atlanta apartment building. It is believed that this single precaution turned the corner from loss to profit for the contractors, the Jordan Company of Columbus, Georgia.

Designers of the building had specified lift-slab concrete construction. In view of this specifica-

*See "Rating the Protective Coverings," Concrete Construction, November 1957, page 9.

This 40,000-square-foot tent of plastic enabled the contractor to keep right on schedule through the blusteriest winter in Georgia's history. The peaked roof permitted rain runoff to avoid weighty water accumulation atop the plastic. During one freeze an inch-thick coating of ice covered the plastic without doing any damage.



Cost of the framework and plastic was justified by its savings in permitting concrete work to proceed on schedule. With temperatures under the plastic shelter as much as 10 degrees warmer than outside, some workers shed heavy outer clothing. Note lift collars on posts, indicating 5 more floor slabs still to be cast.

tion, and because construction had begun in mid-winter, eight weeks was decided upon as ideal timing, profitwise, to complete the ten floors.

To place 4,500 cubic yards of concrete in eight weeks meant full production every day. But Georgia's coldest winter in history threatened to shoot holes in the tight schedule. Accordingly it was decided to cover the entire project with 6-mil polyethylene. It took 40,000 square feet of the plastic.

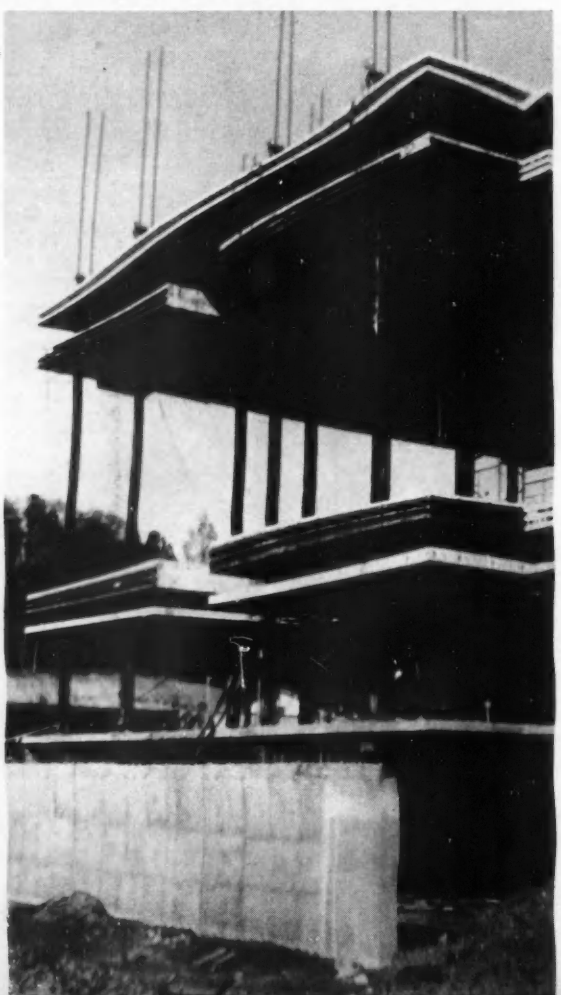
After the first 50-foot steel columns had been positioned, a peaked framework was constructed of 2- by 12-inch rafters and 2- by 6-inch purlins, with 1- by 4-inch ribs to support the plastic. Stretched over the framework, the plastic was held with 1- by 2-inch ribs nailed to the lower 1- by 4-inch pieces. Allowing more than a dozen doorways in one side of the plastic cover gave the concrete crews easy access to work areas.

With the construction site thus protected it was possible to cast the floor slabs, one on top of another, layer on layer, despite the sub-freezing outside temperatures, and the concrete was adequately protected against freezing. Temperatures inside the plastic tent generally ranged from 6 to 10 degrees warmer than outside. Thus, on a day when the thermometer registered 28 degrees, the inside warmth of 34 to 38 degrees made it possible for work to proceed without interruption. Another advantage of the plastic cover was that the crews, assured their work could continue every day, reported to the job regularly and absenteeism was thus held to a minimum.

Casting operations went on all day, longer than would be possible on an unenclosed site and finishers could often work at night. Ample lighting under the plastic hood, and portable industrial heaters, kept the 7-man finishing crew comfortable.

The lift slabs were cast with semi lightweight ready mixed concrete having a maximum dry density of 120 pounds per cubic foot, and a compressive strength at 28 days of 3,000 psi. A manufactured lightweight aggregate called Galite was used. END

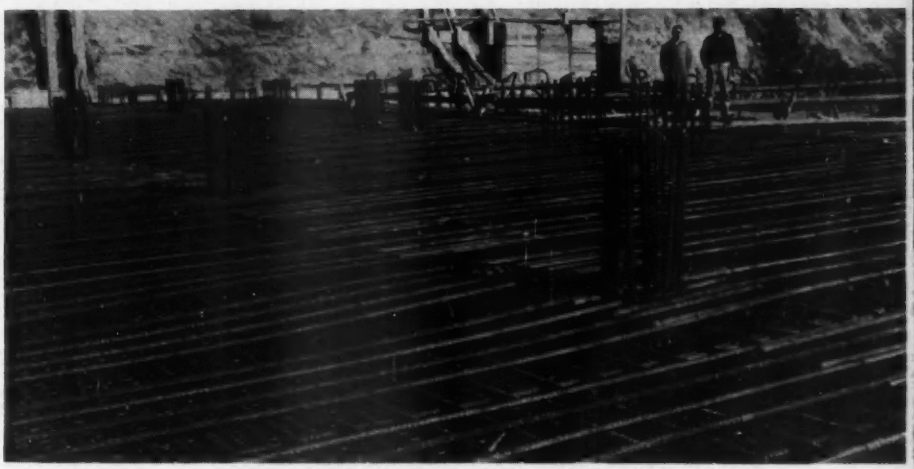
As weather warmed up the plastic enclosure was removed and work was started on jacking the cured slabs into position. About half the polyethylene film was serviceable enough to re-use for protecting construction materials and equipment stored around the job site.



Readers who would like to have additional information on the subject of polyethylene film for winter construction may request it by circling the appropriate key letter on the reader service card in this issue.

LEFT: Welders at work on columns for $5,000,000 garage, part of a redevelopment project in New Haven, Connecticut. Ten parking levels accommodate 1,280 cars. The garage is of beam and slab design. Floor slabs are supported on 3 rows of columns on 54-foot centers. Sixty thousand psi (A-432) high strength bars were used for columns.

BELOW: The East Ohio Gas Building at Cleveland, Ohio, represents one of the first installations of high strength reinforcing bars. More than 450 tons of 75,000 psi (A-431) high strength bars were used in the column verticals. The stronger but smaller columns made it possible to increase floor space and to lower construction costs.



HIGH STRENGTH REINFORCING BARS

IN 1960 CONCRETE CONSTRUCTION published a brief report on the advantages of high strength reinforcing bars and their use in construction in Europe, and predicted an increase in their use in the United States.*

High strength reinforcing bars, with yield points up to 75,000 psi for columns and 60,000 psi for other building components, are available in the United States and are now being used on many American projects. Higher yield bars provide a higher design stress. Used under the ACI building Code, high strength bars can result in considerable savings in steel and concrete in columns, foundations, continuously reinforced highway paving, missile sites and dams. Further advantages noted are an increase in floor space, lowered overall building heights, a reduction in dead load, and greater flexibility and attractiveness of design.

High strength reinforcing bars are produced to ASTM Specification A-432 with a minimum yield of 60,000 psi, and to ASTM Specification A-431 with a minimum yield of 75,000 psi, in all standard sizes. One manufacturer offers a metallurgical service to help builders select the bar with the right chemical and physical properties for the job and the most economical and convenient welding method for the analysis of the bar to be used. END

*See "High Strength Reinforcing Bars," Concrete Construction, August 1960, p. 223.

FILE: Reinforcing

"Concrete construction now offers a flexibility of design never before available in architecture"

—NERVI

A synopsis of a paper titled *"The Influence of Reinforced Concrete and Technical and Scientific Progress on the Architecture of Today and Tomorrow"* presented by Italian Architect P. L. Nervi at a recent conference in London, England.

IN THE LAST 50 YEARS the evolution of architecture has suddenly quickened. Structures have been created which bear little resemblance to conventional buildings. The appearance and architectural possibilities of reinforced concrete, for example, have been radically changed by perfected building methods. "At first reinforced concrete was considered purely from the technical point of view. Once it had fulfilled the structural function entrusted to it, it was hurriedly covered up with masonry and marble facings: it was accepted as a brutal necessity, but hidden as soon as it had served its purpose." During the past 50 years, however, continual refinement of building technique has overcome many of the difficulties of execution.

It is not easy for instance "to obtain a mix giving an interesting surface that is regular but not uniform." It is not achieved merely by the designer wishing it. "Every detail contributes to and is necessary to a good result; the exact preparation of the frame of the formwork; the quality of the timber in contact with the mix; the oil with which the timber is coated to prevent the mix from sticking; the quality of the mix; special attention to the compaction or vibration; the sort of distance pieces needed to hold the reinforcement far enough from the exterior surfaces of the concrete to prevent its coming to the surface and causing rust stains; careful programming of casting to avoid, as far as possible, double lifts which always cause irregular stains; the division of the stages of casting exactly by means of little corrugations and, finally, a special executive capacity, or more precisely a good understanding on the part of the directors and operatives of the building firm of the importance of all these little details."

Such problems were solved only by study. Unfortunately even today such technical factors are not sufficiently understood or taken into consideration by designers and builders. This is why one sees good projects losing part of their expressive force. They suffer either from poor workmanship or from design that is out of touch with modern building methods.

"A light sand-blasting was used, I think for the first time, on the exposed concrete parts of the UNESCO building and it proved to be particularly successful in removing the stains left by the oil spread on the formwork to prevent the mix from sticking and in eliminating the whitish efflorescence which sometimes occurs during the curing period. The sanding removes none of the surface's freshness which is mostly due to the markings of the planking and the pattern of the knots and

grain of the wood. Even this quite simple operation needs particular care. The workman in charge has only to allow the sand jet to remain stationary for a few seconds, in a moment of inattention, to cause a permanent erosion."

As a result of improvement in techniques for making formwork, concrete construction now offers a flexibility of design never before available in architecture. We have come into "possession of a material which is highly resistant and has the disconcerting property of starting off plastic and being able to take the shape of whatever mold it is poured into."

In the field of flat structures the use of mobile formwork, built of 'ferro-cemento,' has permitted freer disposition of structural ribs. The preparation of these forms is relatively easy and in large buildings a triple saving results from their low initial cost, from using them repetitively and from the perfection of ceiling finish they achieve which eliminates all need for plastering. These ferro-cemento formworks are made by spreading a high quality mortar of cement and sand onto a widely spread reinforcement made of layers of wire netting and rods of small diameter.

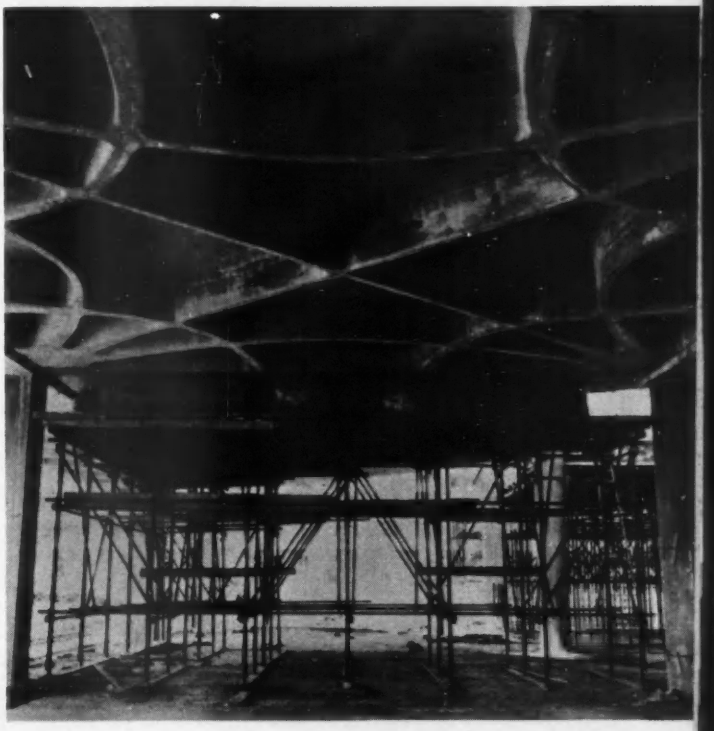
This process is capable of extension to large dimensions. "My use of it has so far been limited to the repetition in series, even over very large areas, of spans of the order of 10 meters by 10 meters with a rib depth (and consequently a lowering of the formwork when moved) of less than a meter."

Problems arise with this technique in deciding the quantity and method of application of oil, in the design of the mobile scaffolding, the profile of the ribs, the dimensions of the bays and in linking the spans together. Such work demands experience "above all, in the foreman and skilled operatives on the site.

"The hand-spreading of mortar on wire netting and rods allows the reduction to a minimum, and even the complete elimination of formwork in timber or other materials." Using the ferro-cemento method, "I have constructed ships, a large sphere designed for an exhibition by Libera, and the undulating sections, 15 meters in span, of the projecting part of the canopy of the Stadio Flaminio at Rome.

"The system has many possibilities. Its essence is that it allows the transformation of any cage of rods and wire netting into a concrete structure. From the structural point of view, when the combination of fabric and rods gives an evenly distributed metal content of about 300 to 400 kilograms per cubic meter of cement mortar, you obtain a very resistant material which is practically waterproof and will not crack. In the field of thin vaults it allows a freedom of architectural expression out of the question in any other type of construction." END

Mobile formwork for the casting of a ceiling by the ferro-cemento technique developed by Nervi and mentioned in his paper. In the upper view the formwork is positioned for casting while in the bottom view it is shown in the lowered position on telescopic scaffolding. Note the smooth finish of the underside of the completed bay in the foreground. This work was done by Mr. Nervi for the Palazzo del Lavoro in Turin, Italy.



letters

sand and concrete

Sir:

I have placed and finished concrete in all kinds of climates for 55 years: in northern Sweden near the Arctic Circle; at the U. S. Naval Base, San Juan, Puerto Rico; for Kalman Floor Company throughout the East and Middle West; on Chicago skyscrapers during a ten-year period; and incidently, on residences in Elmhurst, Illinois.

In my opinion not enough is done to assure the use of proper sand. People don't understand that scaling, crazing, dusting, and so forth are often due to poor sand in the mix. For example, one firm in the eastern part of the United States blasts and bulldozes rock out of the mountainside. This rock is soft sandstone with many cracks and crevices filled with dirt and roots all of which goes into a crusher, is screened to different grades, and sold as building sand. For planting potatoes this would be fine—but not for concrete. This sand costs 50 cents less per cubic yard than washed sand and is therefore attractive to buyers. They refuse to believe that its use results in poor concrete.

The Federal government and most states do have some restrictions, but sometimes inept inspectors or politicians take charge, and specifications are not met. Let's hope the public will get its eyes opened some day.

JOSEPH SEABLOM
Marion, Penna.

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cracking

Sir:

In your August issue, page 229, in the article entitled "Some Notes on Cracking," you have a caption stating: "This severe cracking in a highway pavement was attributed to an excessively low water/cement ratio . . ."

Just what do you mean? If the water/cement ratio was correct for the cement hydration, and cement content was low, would you say, "excessively low water/cement ratio" just to fit the remark into the discussion, or is it truly low cement content?

Please explain.

JAMES BOMBA, P. E.
Line Material Industries
McGraw-Edison Company
Milwaukee, Wisc.

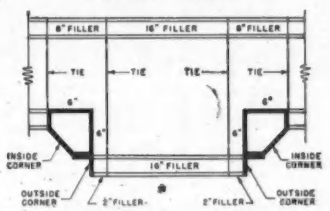
Mr. Bomba's point is well taken. The caption would have done a better job if it had mentioned only the low cement content, since the w/c ratio could have been entirely acceptable.

EDITOR

Symons all-purpose forms

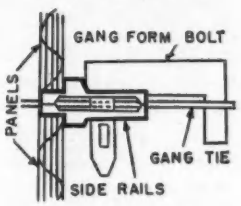
save time, labor and material

CUT-UP WALLS



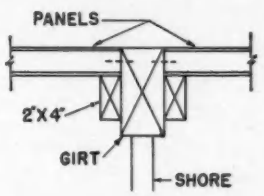
You can get what you need from Symons for cut-up wall construction. Our line includes standard panels, fillers, corners, special brackets, pilaster forms, brick ledges, corbels plus ties and other accessories.

GANG FORMING



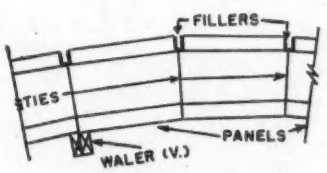
By using Symons steel-ply forms with the new gang form bolt, any size gang section can be made up without the use of fillers between each panel. You can break back ties before removing the gang section.

SLAB FORMING



When forming slabs with Symons steel-ply forms, the need for joists, and nailing usually required is eliminated. Panels are laid directly on top of the stringers. There are no plywood sheets to nail down.

CIRCULAR WALLS



Symons steel-ply forms and flexible steel fillers in 1", 1½" and 2" sizes are suitable for most any radius circular walls. Ties run directly through the slots in the center of the fillers. Minimum waling and bracing.

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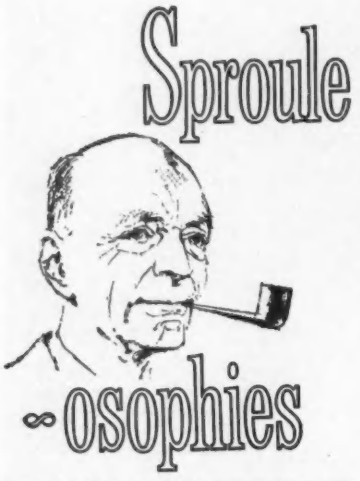

Common sense is not so common.

—Voltaire

THAT'S a true enough saying. Of course, when it comes to a man like Jim McIntyre, things can get pretty uncommon and still make a lot of sense. Jim likes to tackle jobs that other engineers wouldn't touch with a ten-foot pole. But everyone thought he had gone too far when he accepted a big highway paving job in late fall.

Actually I had something to do with his accepting. First time I ever saw Jim have trouble making up his mind. We were both happy that I had the answer to cold weather concrete problems . . . calcium chloride.

I told Jim that calcium chloride will cut set time by more than half. And his concrete will have higher early and final strength. My argument was clinched when I mentioned lower costs. Chloride cuts the cold-weather protection period in half, so there's less expense for labor, heaters, fuel, and canvas.

It was only common sense for Jim to accept the job *and* put in a big order for calcium chloride. And it makes common sense for you to up your cold weather profits. Send for our booklet, "Better Concrete in Every Season with Wyandotte Calcium Chloride." Write: *Wyandotte Chemicals Corporation, Dept. FS, Wyandotte, Michigan. Offices in principal cities.*

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books

Concrete Pavement Design and Performance Studies: 1960. Bulletin 274. *Published by Highway Research Board, National Academy of Sciences—National Research Council, 2101 Constitution Avenue, Washington 25, D. C. 161 pp. Illus. $3.40.*

Research findings from a variety of experimental projects on concrete pavement are reported in this bulletin. Included are results of tests involving performance of continuously-reinforced concrete and non-reinforced concrete, spacing of joints, corrosion of load transfer joints, merits of skewed joints, and other pavement design features.

Practical Design of Structural Members. *By Thomas A. Lucy. Published by F. W. Dodge Corporation, 119 West 40th Street, New York, N. Y. 432 pp. Illus. $12.00.*

This comprehensive manual of design data emphasizes practical, workable results which will enable the designer to think in terms of structures rather than in mathematical equations. It contains many time-saving short cuts and methods which are applicable to all conditions and requirements of stress analysis, and hundreds of useful tables, charts, and diagrams which are supplemented by comprehensive analyses and discussions. Among the members and connections examined are these important types: reinforced concrete — beams and slabs, columns, foundations and footings, retaining walls, and masonry; structural steel — beams, plate girders, columns, rivets and connections, angles, roof trusses, joists, and steel deck; wood — beams and joists, flooring and sheathing, stud partitions, and posts; plus thorough analyses of rigid frames, wind stresses, and earthquake resistance.

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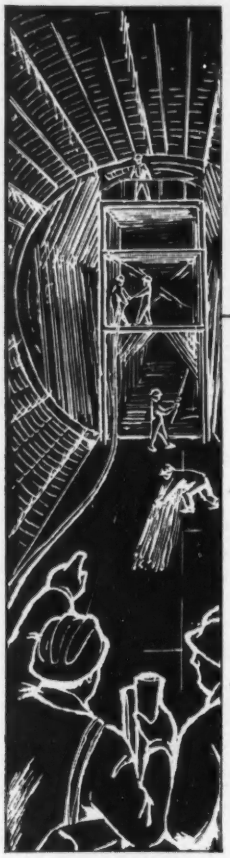

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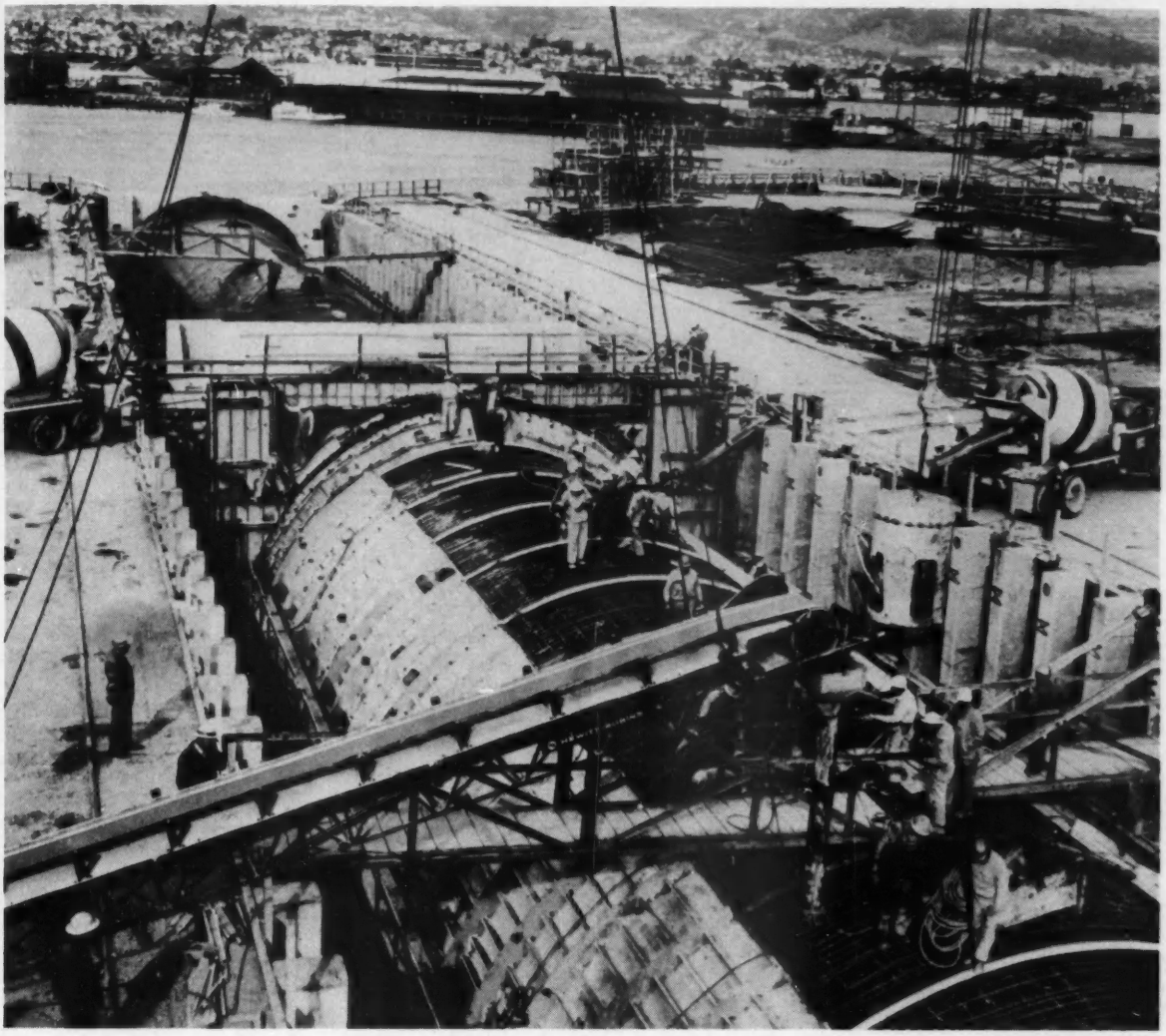

CREDITS: Owner, State of California, Department of Public Works, Division of Highways; Contractor, Pomeroy-Bates & Rogers-Gerwick.

Builders of Concrete Tubes Gain More Advantages with PLASTIMENT

In casting the twelve, 37-ft diameter, 200-ft long, segments of the new Webster Street Tunnel between Alameda and Oakland, California, the contractor chose **Plastiment,** the admixture which provided these specific advantages.

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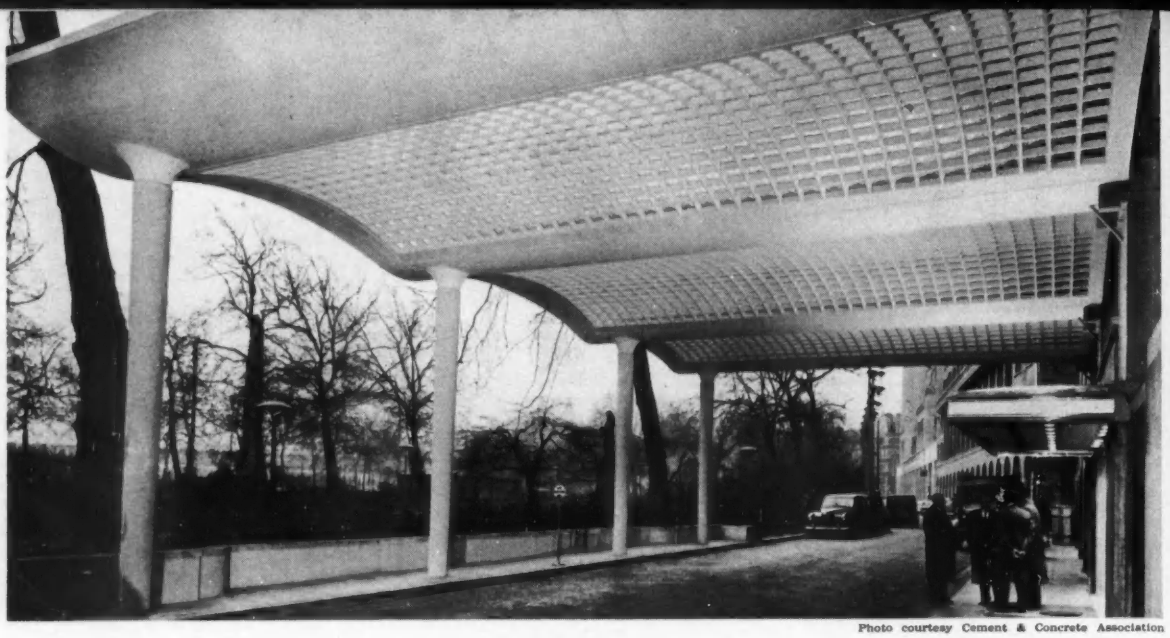
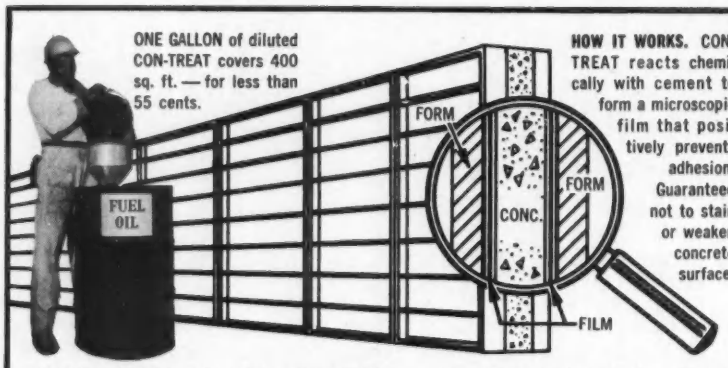


Photo courtesy Cement & Concrete Association

concrete updates venerable hotel

London, England—One of the world's oldest and most renowned hotels, The Savoy, has had its venerable face lifted with the construction of a very modern concrete and glass canopy. The 2500-square foot structure, consisting of three arched bays with cantilevered slab extensions on each side, was cast in place using ready mixed concrete. Support at the building site is provided by bearings cut into the main structure, while tapered columns, lightly sandblasted after stripping, carry the loads on the open side. The 3⅞-inch thick glass lenses in the main bays are supported by cast-in-place concrete ribs each of which contains a single steel reinforcing rod.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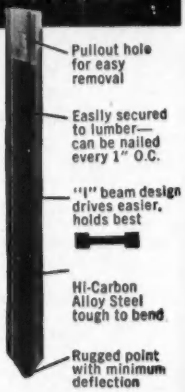
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ALPHA news and notes from the field

BETTER CONSTRUCTION THROUGH BETTER USE OF CEMENTS

Overcoming the Problems of Winter Concreting

73°F is usually considered to be the practical temperature for hydration, the chemical reaction in concrete that takes place between cement and water. At temperatures higher than that, the rate at which concrete hardens and gains strength is accelerated. At lower temperatures the rate is retarded. At 32°F the rate is very slow, and below freezing there is practically no gain in strength. Successful winter concreting requires that the temperature of the concrete when placed be high enough so that it will harden; and that the concrete be kept at a suitable temperature until it has gained ample strength.

The following precautions will help avoid difficulties and costly failures in cold weather concreting.

Preparing the Subgrade

Concrete should never be placed on a frozen subgrade because of the danger of settlement when the ground thaws. All ice and frost should be removed from inside the forms and from reinforcing steel. This is done best with live steam.

Effects of Temperature

Use heated concrete when air temperature is expected to be 40°F or below within twenty-four hours of concrete placing. The temperature of the heated mix when placing in the forms should be at least 70°F to allow for initial heat loss to forms and subgrade . . . however, the concrete should never be heated over 80°F.

Concrete must be properly placed and adequately protected to avoid damage even though heated concrete is used.

If average daily temperatures are expected to be below 55°F in the next several days, continuous protection is necessary to keep concrete temperature to a minimum of 50°F for at least five days. This is essential as concrete must gain sufficient strength . . . above 1500 p.s.i. . . . to resist the effects of freezing.

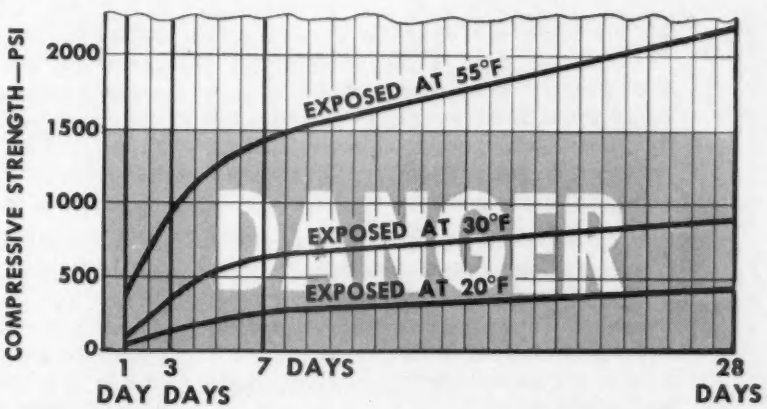
When artificial heat is used, the concrete must be protected from drying out. It should also be protected from direct exposure to rain and sleet when heat is removed . . . because *any* water-saturated concrete, less than a month old, is readily susceptible to freeze-thaw damage.

Concrete gains strength slowly at low temperatures. To obtain the given design strength in severe weather, additional cement or Hi-Early cement may be necessary.

Protection of Concrete

In fairly mild weather a covering of tarpaulins may be sufficient protection. A layer of straw covered with tarpaulins will protect against more severe conditions, but an enclosure of tarpaulins or other weathertight material with artificial heat is necessary for proper protection in many cases. Live steam will provide moisture as well as heat. In other cases radiators, unit heaters or salamanders are used.

Oil-burning salamanders used as space heaters require sufficient venting to prevent early damage to the concrete as well as danger to the workmen. They should not be placed directly on the concrete because they can cause localized drying out during the curing period.



Same mix at 70°F temperature would provide 3250 p.s.i. at 28 days.

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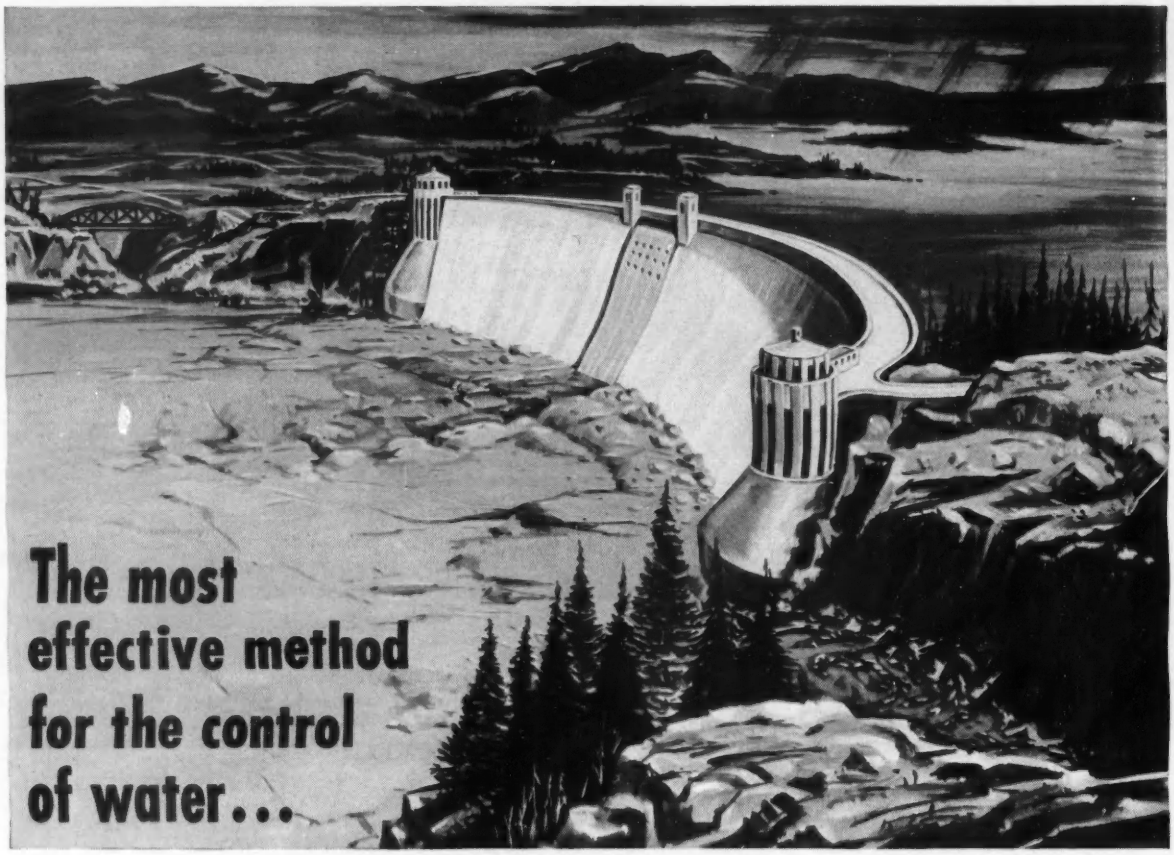

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Concrete may be one of the greatest structural materials but a small amount of water, slowly permeating into the surface and subjected to freeze-thaw cycles can wreak considerable damage, even in the space of a single year. Spalling, cracking, flaking, efflorescence and staining can result from the unrestrained action of water upon masonry structures.

Now, however, with the development of Surtiseal after many years of research, there is available an effective and economical protective water-proofing compound that produces a clean, long-lasting, water repellent surface on all masonry surfaces from massive concrete, to cinder or concrete block, mortar, cement compositions and stucco.

Surtiseal is a clear, colorless liquid of low viscosity containing esters of boron and silicon in an aqueous base. It is stable, odorless and non-inflammable, unlike many ordinary water-proofing compounds. What's more, it absorbs readily into masonry surfaces for excellent coverage and lasting protection. One application covers an area of from 100 to 200 square feet and, properly applied, will last from 5 to 10 years, depending on the kind of surface treated.

Surtiseal can be applied easily by brush, roller or spray; goes on wet cement, concrete and damp basement walls with the same effectiveness as on dry masonry. May be used alone or forms an excellent base for masonry paint. And the surface brightener in Surtiseal will enhance masonry appearance. It actually improves visibility in road and turnpike applications.

You can rely on Surtiseal to protect sidewalks and roads from pitting due to salt and calcium chloride applied during winter icing, to prevent concrete cracking due to freezing and thawing, and to resist stains and discoloration on concrete, cement and stucco surfaces. Ideal for damp cellars, swimming pools, cinder block walls, tile cement, asbestos insulation and many other applications, especially where subject to hydrostatic heads, or condensation.

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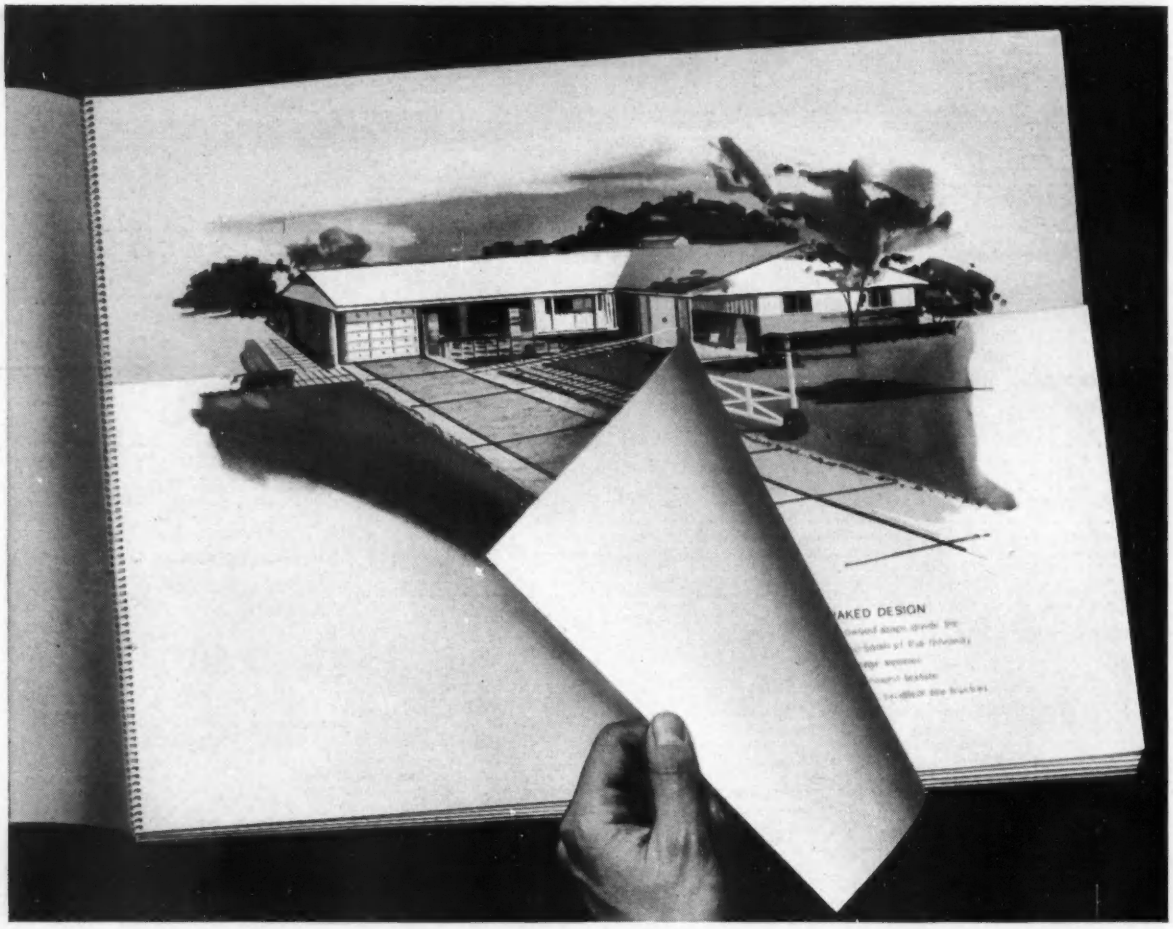

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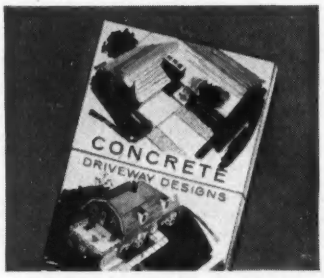

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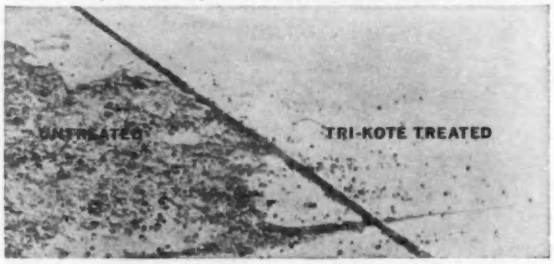

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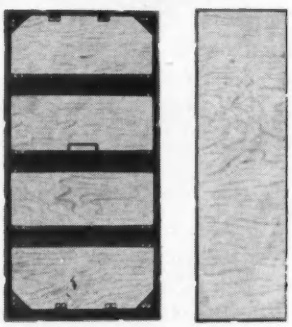

ONLY THE NEW ATLAS COMPO FORM HAS ALL THESE FEATURES:

1. Strong 3" deep, high tensile steel frames. Rolled edges protect against bending or nicking. **2.** Box shaped stiffeners in frame combine light weight with high strength and rigidity. **3.** Continuous seat for plywood panel with extra supports at corners. **4.** Plywood panel held to frame by "wide thread" screws to provide smooth, unmarred forming surface. **5.** Specially treated, moisture resistant, plastic coated plywood panels . . . good for hundreds of reuses. **6.** Panels can be quickly reversed at work site. No "lefts" or "rights"—fronts or backs. **7.** Handles and lighter weight (5 lbs. per sq. ft.) allow one man to handle 2' x 8' panel easily. **8.** Wide variety of sizes and adjustable fillers provide completely flexible system suitable for all forming. **9.** Need less ties. Tie system carries concrete pressure directly from panel forms to the ties. Need no walers. **10.** Tie system allows removal of panels at any point or time...and erection or stripping from any point.

For further information, free literature—or help in planning your concrete form work, write or call:

atlas concrete form DIVISION OF CONVER STEEL & WIRE CO., INC.

Atlas Compo Forms are available, directly from factory, for purchase, rental, or rental with option to purchase!
There are many other advantages in the new Atlas Compo Form system...and, in addition, Atlas Concrete Form Division's Engineering Department provides detailed drawings assuring maximum efficiency in the use of Atlas Compo Forms.

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